Jian-xin Zhu, Guan-jie Wang, 2015. New computational treatment of optical wave propagation in lossy waveguides. *Frontiers of Information Technology & Electronic Engineering*, **16**(8):646-653. [doi:10.1631/FITEE.1400406]

New computational treatment of optical wave propagation in lossy waveguides

Key words: Adjoint operator, Orthogonal, Chebyshev, Pseudospectral method, Dirichlet-to-Neumann map

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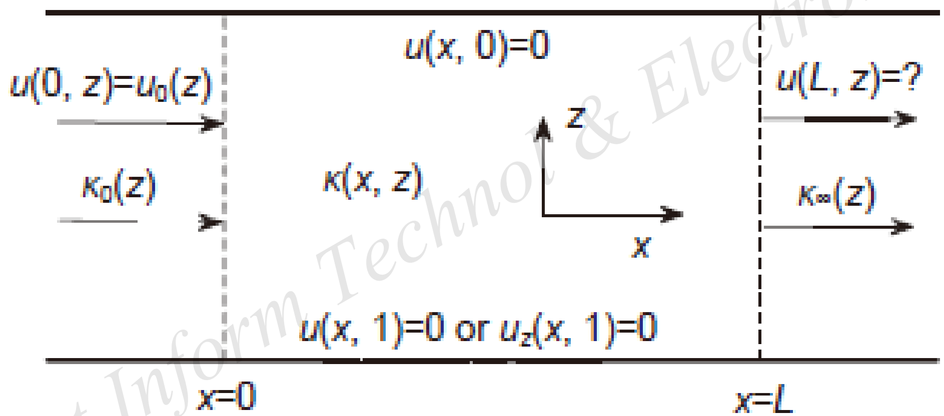
Introduction

- Optical wave propagation in lossy waveguides is described by the Helmholtz equation with the complex refractive-index.

- The Chebyshev pseudospectral method is used to discretize the transverse operator of the equation.

- An operator marching method, a one-way re-formulation based on the Dirichlet-to-Neumann (DtN) map, is improved to solve the equation.

Problem sketch



Simulation results

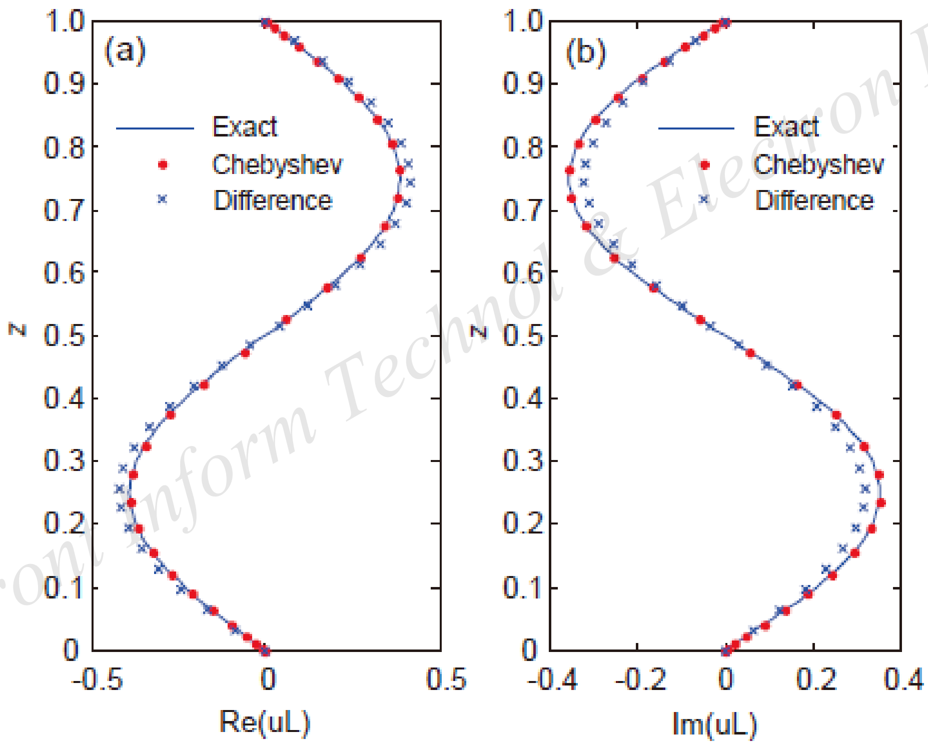


Fig. 2 Comparison of two methods for case 1: (a) real part of uL; (b) imaginary part of uL

Simulation results (Con'd)

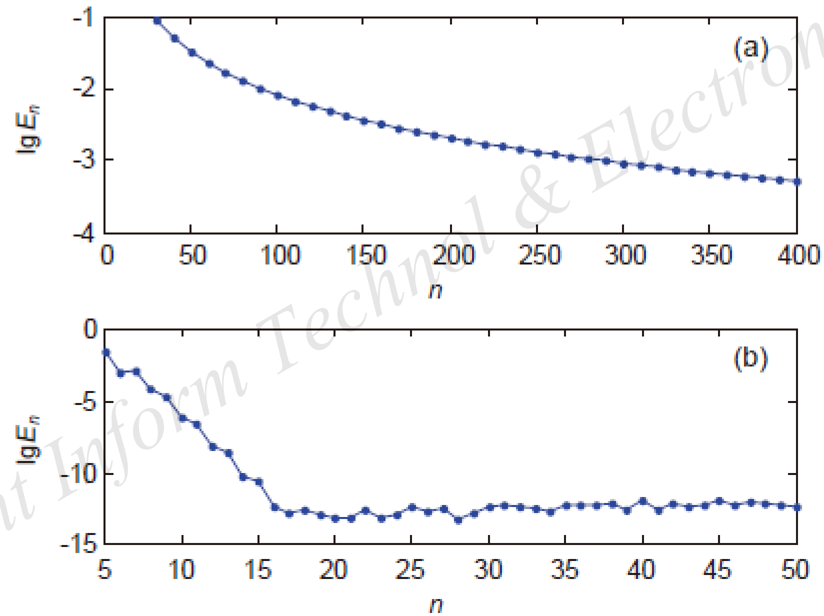


Fig. 3 Relative errors for different n's for case 1: (a) finite difference method; (b) Chebyshev pseudospectral method

Conclusions

- We propose a new method for the computation of propagation in lossy waveguides.
- The method is also suitable for some complex problems.